Surgical Management of Neurogenic Lower Urinary Tract Dysfunction

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KEYWORDS

• Neurogenic bladder • Urinary diversion • Spina bifida • Urinary reconstruction • Transitional urology • Congenital urology

KEY POINTS

- Surgery serves to augment, enhance, or obviate medical therapy for patients with neurogenic lower urinary tract dysfunction.
- Indications for surgery include failure of maximal medical therapy, inability to perform or aversion to clean intermittent catheterization, refractory incontinence, and complications from chronic, indwelling catheters.
- The catheterizable ileocecocystoplasty augments the bladder and creates a "custom fit" catheterizable channel while creating a single bowel anastomosis and obviating the need for a detrusor tunnel.
- Complications from surgery are high. Patients and their caregivers must provide adequate maintenance of their reconstruction to ensure longevity while mitigating complications.
- Surgeons must account for individual characteristics, including physical/cognitive function, financial/social support, access to care, motivation, comorbidities, and natural history of their underlying neurologic dysfunction when fashioning a plan.

INTRODUCTION AND NATURE OF THE PROBLEM

Neurogenic lower urinary tract dysfunction (nLUTD) can have a profound impact on the quality of life of patients with congenital or acquired neurologic disease.[1] Spina bifida/myelomeningocele (SB) is the most common cause of congenital nLUTD and comprises the largest group of adult congenital urologic patients in the United States.[2] Other causes of congenital nLUTD progressing into adulthood include cerebral palsy, epispadias/exstrophy complex, and Eagle-Barrett syndrome.

Improvements in perinatal, pediatric, and adolescent care have extended the life expectancy of patients with SB and other congenital conditions. Unfortunately, the transition of care from child to adulthood has proved challenging, with less than 50% of children successfully establishing adult care.[3] Adult urologists often lack appropriate training in the management of congenital urologic patients; as such, this population is at significant risk for upper and lower urinary tract deterioration stemming from nLUTD.

Acquired causes of nLUTD include spinal cord injury (SCI), stroke, multiple sclerosis, Parkinson's disease, and a variety of other central and peripheral nervous system disorders that may impact the lower urinary tract. An aging, growing population will certainly increase the prevalence of patients

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with significant nLUTD from acquired conditions. As such, there is an increasing need for physicians dedicated to the care of patients with nLUTD. Herein, we broadly review the role of surgery in patients with nLUTD.

INDICATIONS FOR SURGERY

Optimal management for patients with nLUTD results in a lower urinary tract with (1) a low pressure, highly compliant bladder that protects the upper urinary tracts, (2) has predictable and controlled urine emptying, and (3) is dry. Surgery serves to add to, enhance, or obviate medical therapy to achieve these goals and preserve renal function. There are a variety of indications for surgical intervention (Table 1). For purposes of this article, surgical intervention excludes suprapubic catheter, intradetrusor botulinum injection, and sacral/peripheral nerve stimulation.

Individuals with congenital or acquired nLUTD require a nuanced approach to surgical management because their age, social and financial support, physical and cognitive faculties, and comorbidities contribute to both the decision to perform surgery and which surgery to perform.

Although indwelling urinary catheters carry the perception of improving the health and quality of life in patients with nLUTD by maintaining low bladder pressures and keeping patients dry, many untoward sequelae can result, including infections, obstruction, urethral atrophy, erosion, necrosis, and fistula. Many of these complications are exacerbated by sequential catheter upsizing in reaction to pericatheter leakage.[4,5]

Surgery for Sphincteric Incontinence

Although congenital and acquired nLUTD often arise from disparate neuroanatomic origins, both can result in denervation of the sphincter, resulting in stress urinary incontinence (SUI) from intrinsic sphincter deficiency (ISD). Surgical options, in general, include bulking agents, pubovaginal/bladder neck slings, bulbar urethral sling, artificial urinary sphincter (AUS), bladder neck closure (BNC), and submucosal bulking.

BULKING AGENTS

Indications

First described in 1974 for nonneurogenic SUI in women, injectable bulking agents placed at the bladder neck or posterior urethra lead to submucosal expansion resulting in increased bladder outlet resistance.[6] The European Association of Urology Guidelines on nLUTD and the Neurologic Incontinence Committee of the International Consultation on Incontinence recommend bulking agent use for short-term improvement when there is a demand for a minimally invasive treatment.[7] Although many patients with nLUTD may experience SUI secondary to chronic catheter use, patients with sacral spina bifida or sacral/conus

Table 1
Surgical indications for patients with nLUTD

Indication	Sequelae if Untreated	Goals for Surgery	Surgical Intervention(s)
Failure of maximal medical therapy for elevated bladder pressure	↑ Detrusor pressure ↓ Renal function Recurrent infection	↓ Detrusor pressure	1. SPC 2. Augment ± CCC 3. Urinary diversion
Inability to perform or aversion to urethral CIC	Urinary retention ↑ Detrusor pressure ↓ Renal function	Facilitate CIC Maintain or ↓ detrusor pressure	1. SPC 2. CCC ± augment 3. Urinary diversion
Urinary incontinence	Personal/social embarrassment Skin maceration/ breakdown	Achieve continence	1. SPC 2. Sling 3. AUS 4. BNR
Complications from chronic, indwelling catheters	Pubovesical fistula Urethral erosion Bladder perforation End-stage, contracted bladder	Repair and diversion	1. Urinary diversion 2. Cystectomy ± prostatectomy

Abbreviations: Augment, augmentation cystoplasty; AUS, artificial urinary sphincter; BNR, bladder neck reconstruction; CCC, continent catheterizable channel; CIC, clean intermittent catheterization; nLUTD, neurologic urinary tract dysfunction; SPC, suprapubic cystostomy.